

Title: Using Mouse Gene Expression and Phenotypes to Explore the Effects of Atherogenic Diet

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Abstract:

High-fat diets are associated with increased obesity and metabolic disease in mice and humans. To study the molecular basis of the metabolic response to dietary fat, ten inbred strains of mice were fed atherogenic and control low fat diets. Liver gene expression and whole animal phenotypes were measured and analyzed in both sexes. The influence of strain, sex and diet were strategically explored using analysis of variance (ANOVA) and dimension reduction methods. Strategically combining ANOVA and transformation algorithms could identify important patterns in the multidimensional data structure. Variability in gene expression due to the main effects of sex, strain and diet accounted for over 98% of the variation in the data set. Pairwise differences in diet effects between strains were not evenly distributed, indicating that some strain pairs are similar in their response to high fat diet whereas others differ considerably. Gene set enrichment analyses found that high fat feeding induced the immune response, which may be indicative of liver damage, and repressed cholesterol biosynthesis. The data described here has been made publicly available as an online tool for exploring the effects of atherogenic diet in inbred mouse strains (<http://cgd-array.jax.org/DietStrainSurvey>).